

CLAIMS

1. A method of plating a substrate to fill a
wiring recess formed in a semiconductor substrate with
5 plating metal, said method comprising:

performing an electroless plating process of
forming an initial layer on a substrate; and

10 performing an electrolytic plating process of
filling said wiring recess with plating metal while said
initial layer serves as a feeding layer.

2. An apparatus for plating a substrate to fill a
wiring recess in a semiconductor substrate with plating
metal, said apparatus comprising:

15 an electroless plating tank for forming an
initial layer on a substrate by electroless plating;

an electrolytic plating tank for filling said
wiring recess with plating metal while said initial layer
serves as a feeding layer; and

20 transfer means for transferring a substrate
between said tanks.

3. A method or apparatus for plating a substrate
according to claim 1 or 2, comprising in said electroless
25 plating process or said electroless plating bath:

means for disposing a substrate to be plated in
such a state that a surface to be processed thereof faces
upwardly, and forming a hermetically sealed space by said

Sub A1

surface to be processed; and

plating liquid supply means for supplying an electroless plating liquid to said hermetically sealed space to perform an electroless plating process.

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4. A method or apparatus for plating a substrate according to claim 3, wherein the minimum amount of electroless plating liquid required for performing a predetermined plating on said substrate to be plated is supplied to said hermetically sealed space, and the electroless plating process is performed with said electroless plating liquid in a static state.

5. A method or apparatus for plating a substrate according to claim 3 or 4, further comprising:

pressure pulsation means for generating a pressure in said hermetically sealed space that is higher than atmospheric pressure and for pulsating said pressure.

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6. A method or apparatus for plating a substrate according to any one of claims 3 through 5, further comprising a preparation bath disposed in the vicinity of said hermetically sealed space for supplying said minimum amount of prepared electroless plating liquid to said hermetically sealed space just prior to the electroless plating process.

7. A method or apparatus for plating a substrate

according to claim 6, wherein said electroless plating liquid is processed as a waste liquid without circulating said electroless plating liquid after performing the electroless plating process with said minimum amount of 5 electroless plating liquid.

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8. A method or apparatus for plating a substrate according to claim 1 or 2, wherein said plating liquid used said electroless plating process or said electroless plating 10 bath comprises copper sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) having a concentration of 100 to 250 g/l, sulfuric acid (H_2SO_4) having a concentration of 10 to 100 g/l, and chlorine ions having a concentration of 0 to 100 mg/l.

15 9. A method or apparatus for plating a substrate according to claim 8, wherein said electrolytic plating liquid further comprises at least 0.14 to 70 $\mu\text{mol/l}$ of a sulfur compound expressed by a formula in [A] below, 10 to 5000 mg/l of a macromolecular compound expressed in a 20 formula [B] below, and 0.01 to 100 mg/l of a nitrogen compound;

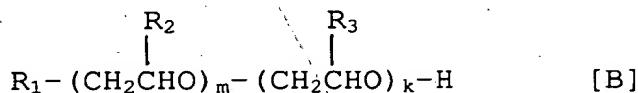
wherein L is an alkyl group having a carbon number of 1 to 6 which is substituted by a lower alkyl group, a lower alkoxy group, a hydroxyl group, or a halogen 25 atom; and X is a hydrogen atom, a $-\text{SO}_3\text{M}$ group, or a $-\text{PO}_3\text{M}$ group (M indicating a hydrogen atom, an alkali metal atom, or an amino group) in the formula [A]; and

R1 indicates a residue of a higher alcohol group

having a carbon number of 8 to 25, a residue of an alkyl phenol with an alkyl group having a carbon number of 1 to 25, a residue of an alkyl naphthol with an alkyl group having a carbon number of 1 to 25, a residue of a fatty acid 5 amide having a carbon number of 3 to 22, a residue of an alkylamine having a carbon number of 2 to 4, or a hydroxyl group; R₂ and R₃ indicate a hydrogen atom or a methyl group; and m and k indicate an integer from 1 to 100 in the formula [B].

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X-L-(S)_n-L-X [A]



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10. An apparatus for plating a substrate to fill
15 a wiring recess formed in a semiconductor substrate with
plating metal, said apparatus comprising:

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one processing tank having an electroless plating
liquid supply path for supplying an electroless plating
liquid to form an initial layer on a substrate by
electroless plating process, and an electrolytic plating
liquid supply path for supplying an electrolytic plating
liquid to fill said wiring recess by electrolytic plating
while said initial layer serves as a feeding layer;
wherein the two paths are selectively switchable.

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11. A method or apparatus for plating a substrate
according to any one of claims 1 through 10, wherein said
plating liquid used in said method or apparatus does not

Sulf A4

include an alkali metal as a pH regulator.

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A4

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